INTERNATIONAL PRELIMINARY EXAMINATION REPORT
International application No. PCT/DE02/04437I.

Basis of the report

1. This report has been drawn on the basis of (*Substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments):*

   The description, pages:

   1-17 as originally filed

   The claims, Nos.:

   9, 10 as originally filed
   1-8, 11 received on 11/18/03 with the letter of 11/13/03

   The drawings, sheets/fig.:

   1/4-4/4 as originally filed

III. No expert opinion prepared about novelty, inventive step and industrial applicability

1. The following parts of the application were not checked to determine whether the claimed invention is to be viewed as novel, based on inventive step (not obvious) and industrially applicable:

   Claims Nos. 1-11

   Reason:

   The description, the claims or the drawing *(please give precise specifications below)* or the above-named claims Nos. 1-11 are so unclear that it was not possible to prepare a meaningful expert opinion *(precise specifications)*:

   See appended sheet

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PAR. III

In a common rail fuel system, in principle the magnitude of the pressure change is not limitable, since in an accident the pressure can drop from system pressure to ambient pressure practically instantaneously; the pressure gradient that occurs in that case is of an unspecified magnitude.

It makes no sense technically to use an injection quantity error for limiting the pressure rise which is caused by an individual deviation in the injection quantity of a nozzle from an ideal characteristic curve.

It is not possible to recognize what technical object is achieved by providing a limitation of the pressure increase, if an injection nozzle injects 10% more or less than specified merely because of wear.

Claim 1 (and the other independent claims) could be clarified with features that define the following, namely:

that depending on an injection quantity error the pressure regulating element is actuated in the sense of limiting the pressure increase, the injection quantity error resulting from the difference between the injection quantity for a calculated opening duration and the fuel pressure that is then presumably present at the moment of injection, and the injection quantity for the computed opening duration and the fuel pressure used in the computation.

Such a procedure does not appear to be derivable from the known methods, since while WO 95 23921 A (BOSCH) 8 September 1995 (1995-09-08) indeed reveals limiting the pressure increase in an injection system, yet this is provided only in regard to limiting the noise, not in order to prevent injection errors through pressure variations.

The other related art uses a different approach, namely the pressure is extrapolated with the pressure increase to the moment of injection, in order to thereby prevent injection errors. This apparently also does not suggest limiting the pressure increase.

New Claims 1 through 11

1. A method for operating a fuel metering system of a motor vehicle, fuel being delivered by at least one supply pump to at least one high pressure area (1), the fuel being injected by at least one fuel injector (8) from the high pressure area (1) directly into at least one combustion chamber (4), at least one sensor (19) detecting the pressure (P) in the high pressure area, and at least one pressure regulating element (18) being provided for adjusting the pressure in the high pressure area (1),
wherein the change in pressure in the high pressure area (1) over time is limited as a function of a specifiable injection quantity error (EMF).

2. The method as recited in Claim 1,
wherein permissible pressure gradient values are stored in speed-dependent and load-dependent characteristic maps.

3. The method as recited in one of the preceding claims,
wherein the limitation is specified in each case for a period (TR) between two rail pressure gradient computations.

4. The method as recited in one of the preceding claims,
wherein the limitation is implemented at least as a function of an instantaneous pressure (P) in the high pressure area (1) and/or a sampling rate (TA) of the pressure measurement in the high pressure area (1) and/or an engine speed (N) and/or specific data of the supply pump (AN).

5. The method as recited in one of the preceding claims,
wherein limiting values are determined in at least two different ways, the minimum value of the limiting values is determined by a comparison operation, and this minimum value is selected as the limit for the change in pressure in the high pressure area (1) over

time.

6. A computer program for an internal combustion engine of a motor vehicle, with a sequence of instructions that are suitable for performing the method as recited in one of Claims 1 through 5 when they are executed on a computer, in particular a control unit for an internal combustion engine.

7. The computer program as recited in Claim 6, wherein the sequence of instructions is stored on a computer-readable data medium.

8. A control unit for operating a fuel metering system of a motor vehicle, fuel being delivered by at least one supply pump to at least one high pressure area (1), the fuel being injected by at least one fuel injector (8) from the high pressure area (1) directly into at least one combustion chamber (4), at least one sensor (19) detecting the pressure (P) in the high pressure area, and at least one pressure regulating element (18) being provided for adjusting the pressure in the high pressure area (1), wherein the change in pressure in the high pressure area (1) over time is limitable as a function of a specifiable injection quantity error (EMF).

11. A fuel metering system for an internal combustion engine of a motor vehicle, having at least one supply pump for delivering fuel to at least one high pressure area (1), having at least one fuel injector (8) for direct injection of the fuel from the high pressure area (1) into at least one combustion chamber (4), having at least one sensor (19) for detecting the pressure (P) in the high pressure area and having at least one pressure regulating element (18) for setting the pressure in the high pressure area (1),
wherein the change in pressure in the high pressure area (1) over time is limitable as a function of a specifiable injection quantity error (EMF).